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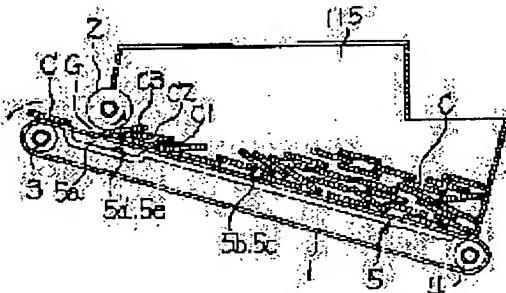
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(54) COIN FEEDING DEVICE

(57)Abstract:

PROBLEM TO BE SOLVED: To stably and separately carry coins by surely resolving the overlap state of coins by the returning force of a separation roller even in the case that overlapping coins are caught between a carrying belt and the separation roller.

SOLUTION: If coins C enter between a carrying belt 1 and a separation roll 2 while overlapping, the carrying belt 1 is deformed in the escape direction along belt escape parts 5d and 5e of a belt guide member 5 to form a space equal to or larger than a passage space G though a force in the belt pressing direction is generated, and therefore, a force in the sending direction to a coin C3 is not increased. The passage space G is kept by a projecting space forming part 5a extended along the coin carrying direction, and two or more coins cannot pass simultaneously, and the contact area to the carrying belt 1 of the coin C3 to be returned by the separation roller 2 is reduced to an extent approximating the width of the space forming part 5a to reduce the force in the sending direction. By this condition, the overlap state of coins is resolved by the returning force of the separation roller 2, and coins are surely and separately carried.



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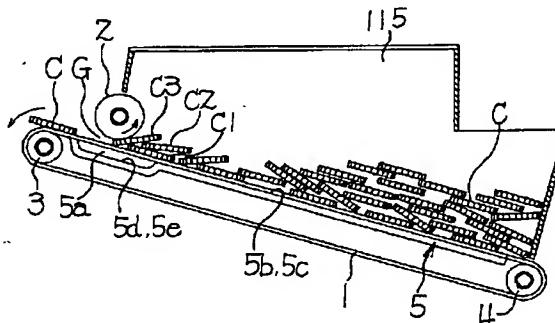
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(54)【発明の名称】 硬貨送出装置

(57)【要約】

【課題】 搬送ベルトと分離ローラとの間に重なり状態の硬貨が入り込んでも、分離ローラの戻し力により確実に硬貨の重なり状態を解消して1枚ずつの分離搬送を安定して行えるようにする。

【解決手段】 搬送ベルト1と分離ローラ2との間に硬貨Cが重なり状態で入り込んだ場合、ベルト圧接方向の力が発生しても搬送ベルト1がベルト案内部材5のベルト逃げ部5d, 5eに従い逃げ方向に変形して通過間隔G以上の間隔を形成するので、硬貨C3に対しては送り出し方向の力が増加しない。また、通過間隔Gは硬貨搬送方向に沿わせた凸状の間隔形成部5aで維持されており、2枚以上の硬貨は通過せず、かつ、分離ローラ2により戻そうとする硬貨C3の搬送ベルト1への接触面積が間隔形成部5aの幅程度に減り送り出し方向の力も減少する。このような状況によれば、分離ローラ2の戻し力で硬貨の重なり状態を解消して、1枚ずつ確実に分離搬送させることができる。



【特許請求の範囲】

【請求項1】 硬貨搬送方向に回転駆動される搬送ベルトと、この搬送ベルト上に硬貨1枚分の通過間隔を有して配設され、搬送ベルトの硬貨搬送方向の回転に対して対向周面が逆方向に移動するよう回転駆動される分離ローラとを備え、搬送ベルト上に積み重ねられた硬貨を1枚ずつ分離しながら搬送する硬貨送出装置において、搬送ベルトの内周側に配設されて、分離ローラに対向する部位に通過間隔を形成する硬貨搬送方向に沿わせた凸状の間隔形成部とこの間隔形成部を挟んで通過間隔以上の間隔を形成可能なベルト逃げ部とを有するベルト案内部材を備えることを特徴とする硬貨送出装置。

【請求項2】 搬送ベルトは幅方向に2分割された分割ベルトであり、ベルト案内部材は間隔形成部が分割ベルト間に位置することを特徴とする請求項1記載の硬貨送出装置。

【発明の詳細な説明】

【0001】

【発明の属する技術分野】 本発明は、例えば、POS端末やECRに接続して使用するのに適した釣銭自動払出装置等で用いられる硬貨送出装置に関する。

【0002】

【従来の技術】 従来、釣銭自動払出装置は、種々の金種が混合した状態の硬貨を投入口から一括して投入し、それらの硬貨が正貨であるか否かをチェックしてから硬貨毎に分類して硬貨収納部に収納しておき、指定された硬貨とその枚数とを払い出すようにしている。

【0003】 ここで、図5は従来の釣銭自動払出装置100の一例を示す平面図である。図5に示す従来の釣銭自動払出装置100について、硬貨の流れに沿って説明する。まず、釣銭自動払出装置100の右手手前に設けられた硬貨投入口101から一括投入された硬貨は、投入口ベルト102によって搬送され、その搬送途中で投入口ローラ103によって1枚ずつ送り出されて1列搬送される。1列搬送された硬貨は、投入口ベルト102から搬送ベルト104に引き渡され、この搬送ベルト104による搬送過程で外径チェック部105による外径チェックを受ける。その結果、搬送途中の硬貨が正貨でない場合、或いは、後述する硬貨収納部が満杯である場合には、その硬貨はリジェクト・オーバーフロー部106によってリジェクトされる。このリジェクト・オーバーフロー部106でリジェクトされた硬貨は、リジェクト・オーバーフロー部106の下側に設けられたリジェクト・オーバーフロー硬貨収納部107に収納される。

【0004】 リジェクト・オーバーフロー部106を通過した硬貨は、搬送ベルト108に引き渡され、さらに後続の搬送ベルト109に引き渡される過程において方向変換部110で進行方向が直角に変換される。このように、硬貨は、投入口ベルト102、投入口ローラ103、及び搬送ベルト104、108、109によって構

成された硬貨搬送部111によって所定の方向に搬送される。進行方向変換後の硬貨は、搬送ベルト109に沿わせて順次穴幅寸法が拡大していく金種毎の選別穴112を備えた硬貨選別部113に案内される。選別穴112は、1円・5円・10円・50円・100円・500円の各々の金種の直径に対応する大きさであって、6個設けられている。従って、硬貨は、その金種毎に定められた選別穴112より順次落下する。

【0005】 次いで、硬貨が選別穴112から落下する位置には金種毎に仕切板114で仕切られた硬貨収納部115が設けられ、この硬貨収納部115の各々の金種毎の底面部分には払出搬送用の搬送ベルト116が回転駆動自在に設けられており、硬貨収納部115に収納された硬貨はその出口に向かって搬送される。ただし、選別穴112から硬貨収納部115に落下した硬貨はその落下位置近傍に積み重なってそのまま搬送されるので、この積み重なった状態の硬貨を1枚ずつに分離して搬送する必要がある。このため、搬送ベルト116が駆動されると、硬貨収納部115に収納された硬貨は、その搬送過程で分離ローラ117を経由して搬送されることになる。

【0006】 分離ローラ117により1枚毎に分離された硬貨はそのまま搬送ベルト116によって搬送され続け、所定枚数の硬貨を金種毎に常に一列に整列させて待機させる硬貨待機部121に到る。硬貨待機部121では、所定の枚数の硬貨を一時的に停止させて待機するとともに、POS端末やECRからの指令に従って必要枚数の硬貨を送り出すように動作制御がなされる。つまり、硬貨収納部115に収納された硬貨は、搬送ベルト116を主要な構成要素とする硬貨払出部122によって所定の硬貨払出位置に払い出される。硬貨払出位置に払い出された硬貨は、上方開口の硬貨払出口123にまとめられる。そこで、キャッシャは、硬貨払出口123に一括して払い出された硬貨をつかみ取り、釣銭として顧客に渡すことができる。

【0007】 ここで、搬送ベルト116上で積み重なった状態の硬貨Cの分離ローラ117による分離・搬送の動作を図6に示す概略側面図、図7に示す概略平面図を参照して説明する。搬送ベルト116の内周面側には一対の駆動ローラ118、従動ローラ119とともに内周面側下面を平坦状に受ける平板状のベルト案内板120が配設され、全体として、昇り傾斜となるように配設されている。搬送ベルト116と分離ローラ117とは、硬貨Cが1枚だけ通過し得る通過間隔Gを隔てて配設されている。また、搬送ベルト116と分離ローラ117とは、互いに同方向に回転駆動される構成とされている。即ち、搬送ベルト116の硬貨搬送方向の回転に対して分離ローラ117は対向周面が逆方向に移動するよう同一の駆動源（モータ）により回転駆動されるものである。

【0008】これにより、積み重なった状態の硬貨C中の或る硬貨が搬送ベルト116と分離ローラ117とに挟み込まれた場合、その硬貨は分離ローラ117との摩擦力により搬送方向上流側へ押し戻される。よって、その硬貨の下部の他の硬貨は搬送ベルト116による硬貨搬送方向の搬送力を受けて搬送ベルト116と分離ローラ117との間の通過間隔Gを通過することで1枚だけが順次送り出される。

【0009】

【発明が解決しようとする課題】ところが、搬送ベルト116上の硬貨Cは元々不規則な状態で積み重なっているので、分離部分での硬貨C同士の重なり状況によっては、正常に分離することができない場合がある。例えば、図6に示すように或る硬貨C1、C2上に重なりやや前傾姿勢で分離ローラ117と搬送ベルト116との間に入り込もうとしている硬貨C3がある場合、この硬貨C3よりも上流側に他の硬貨C1、C2があるため、分離ローラ117の回転による戻し力では硬貨C1を戻せないと同時にこれらの硬貨C3、C1、C2の重なり状態を解消することもできず、硬貨詰まりの一因ともなる。特に、図6に示すような状況では、上流側の他の硬貨C1、C2等に対する搬送ベルト116による搬送力が前傾姿勢の硬貨C3に対してくさび作用を示し、この硬貨C3の先端部にはベルト圧接方向の力Fが働くため、硬貨C3に対する送り出し方向の力が増加し、益々、分離ローラ117によってはこの硬貨C3を押し戻していくくなる。結果として、分離ローラ117の駆動系に対して大きな負荷をかけてしまうことになる。

【0010】そこで、本発明は、搬送ベルトと分離ローラとの間に重なり状態の硬貨が入り込むようなことがあっても、分離ローラの戻し力により確実に硬貨の重なり状態を解消して1枚ずつの分離搬送を安定して行わせ得る硬貨送出装置を提供することを目的とする。

【0011】

【課題を解決するための手段】請求項1記載の発明は、硬貨搬送方向に回転駆動される搬送ベルトと、この搬送ベルト上に硬貨1枚分の通過間隔を有して配設され、搬送ベルトの硬貨搬送方向の回転に対して対向周面が逆方向に移動するよう回転駆動される分離ローラとを備え、搬送ベルト上に積み重ねられた硬貨を1枚ずつ分離しながら搬送する硬貨送出装置において、搬送ベルトの内周側に配設されて、分離ローラに対向する部位に通過間隔を形成する硬貨搬送方向に沿わせた凸状の間隔形成部とこの間隔形成部を挟んで通過間隔以上の間隔を形成可能なベルト逃げ部とを有するベルト案内部材を備える。

【0012】従って、搬送ベルト上に積み重ねられた硬貨に関して、搬送ベルトと分離ローラとの間に重なり状態で入り込んだ場合、ベルト圧接方向の力が発生しても搬送ベルトがベルト逃げ部に従い逃げ方向に変形することで通過間隔以上の間隔を形成するので、硬貨に対して

は送り出し方向の力が増加することはない。このとき、搬送ベルトと分離ローラとの間の通過間隔は硬貨搬送方向に沿わせた凸状の間隔形成部により維持されており、2枚以上の硬貨が通過することはない上に、分離ローラにより戻そうとする硬貨の搬送ベルトへの接触面積が間隔形成部の幅程度に減り送り出し方向の力が減少することになる。このような状況によれば、分離ローラの戻し力により硬貨の重なり状態を解消して、1枚ずつ確実に分離して搬送させることができる。

【0013】特に、請求項2記載の発明によれば、請求項1記載の硬貨送出装置の搬送ベルトは幅方向に2分割された分割ベルトであり、ベルト案内部材は間隔形成部が分割ベルト間に位置するので、ベルト逃げ部部分で分割ベルトを逃げ方向に変形しやすくなる上に、搬送力を持たない間隔形成部が直接通過間隔を形成しているので、分離ローラにより戻そうとする硬貨の搬送ベルト（分割ベルト）への接触面積が減り送り出し方向の力が減少するため、分離ローラにより戻しやすくなる。

【0014】

【発明の実施の形態】本発明の第一の実施の形態を図1ないし図3に基づいて説明する。図1は硬貨送出装置を示す概略側面図、図2はその概略平面図、図3は搬送ベルト等を主体に示す概略斜視図である。本実施の形態の硬貨送出装置も、図5に示したような釣銭自動払出装置100中の硬貨収納部115・硬貨待機部121間の分離搬送部に適用されており、全体構成は釣銭自動払出装置100を利用するものとする。

【0015】まず、本実施の形態の硬貨送出装置は、硬貨収納部115・硬貨待機部121間に配設される搬送ベルト1と分離ローラ2とをベースとして構成されている。搬送ベルト1は幅方向に2分割された分割ベルト1a、1bにより構成されている。搬送ベルト1の内周側には一対の駆動ローラ3、従動ローラ4とともに基本的に内周面側下面を平坦状に受けける平板状のベルト案内部材（ベルト案内部材）5が配設され、全体として、硬貨待機部121側に向けて昇り傾斜となるように配設されている。搬送ベルト1と分離ローラ2とは、硬貨Cが1枚だけ通過し得る通過間隔Gを隔てて配設されている。また、搬送ベルト1と分離ローラ2とは、互いに同方向に回転駆動される構成とされている。即ち、搬送ベルト1の硬貨搬送方向の回転に対して分離ローラ2は対向周面が逆方向に移動するよう同一の駆動源（モータ）により回転駆動されるものである。

【0016】ここに、本実施の形態のベルト案内部材5にあっては、図3に示すように、分離ローラ2に対向する部位に所定の通過間隔Gを形成する凸状の間隔形成部5aが硬貨搬送方向に沿わせて形成され、分割ベルト1a、1b間に位置して外部に露出することで間隔形成部5a自身が分離ローラ2との間の通過間隔Gを直接形成するように構成されている。間隔形成部5aは硬貨通過

幅内の位置に位置している。また、ベルト案内板5には間隔形成部5aを挟んで左右両側に各々の分割ベルト1a, 1bの内周面を受ける平坦部5b, 5cが形成されている。平坦部5b, 5cに関して分離ローラ2に対向する部位付近にあっては下方に凹ませたベルト逃げ部5d, 5eが形成されている。

【0017】このような構成において、搬送ベルト1上で積み重なった状態の硬貨C中の或る硬貨が搬送ベルト1と分離ローラ2とに挟み込まれた場合、その硬貨は分離ローラ2との摩擦力により搬送方向上流側へ押し戻される。よって、その硬貨の下部の他の硬貨は搬送ベルト1による硬貨搬送方向の搬送力を受けて搬送ベルト1と分離ローラ2との間の通過間隔Gを通過することで1枚だけが順次送り出される。

【0018】ところで、搬送ベルト1上の硬貨Cは元々不規則な状態で積み重なっているので、分離部分での硬貨C同士の重なり状況は種々の状況を呈するが、一般的には、搬送ベルト1上で左右方向にジグザグ状に積み重なりながら搬送される。例えば、図1に示すように或る硬貨C1, C2上に重なったままやや前傾姿勢で分離ローラ2と搬送ベルト1との間に入り込もうとしている硬貨C3がある場合を考える。この場合、硬貨C3よりも上流側に他の硬貨C1, C2が存在しており、これらの硬貨C1, C2等に対する搬送ベルト1による搬送力が前傾姿勢の硬貨C3に対してくさび作用を示し、この硬貨C3の先端部にはベルト圧接方向の力が働く。しかし、この部位にあっては、図示例の場合、ベルト案内板5にベルト逃げ部5dが形成されており、左前方に下がった硬貨C3の先端部によってベルト圧接方向の力を受けた部位の分割ベルト1aはベルト逃げ部5d側に変形する。これにより、硬貨C3に対する送り出し方向の力が増加することはない。このとき、硬貨C3の少なくとも中央寄りの一側は間隔形成部5a上で支えられながら搬送され沈み込みが抑えられるので、硬貨C3が通過してしまう程、分割ベルト1aを必要以上に変形させることはない。これは、硬貨C3が主に分割ベルト1b側で搬送される場合でも同様の状況下では、分割ベルト1aがベルト逃げ部5e側に変形し、硬貨C3に対する送り出し方向の力が増加することはない。特に、本実施の形態では、搬送ベルト1が分割ベルト1a, 1bとして分割形成されているので、ベルト逃げ部5d, 5e部分で逃げ方向に変形しやすい。このような状況によれば、分離ローラ2の戻し力によりC3を確実に戻すことができ、硬貨の重なり状態を解消することができ、例えば、硬貨C3が戻されて分離された後の硬貨C1を下流側へ搬送することができる。この際、搬送ベルト1と分離ローラ2との間の通過間隔Gは硬貨搬送方向に沿わせた凸状の間隔形成部5aにより維持されており、硬貨C1の一部は必ず間隔形成部5a上を通過するため、ベルト逃げ部5d或いは5eを通って2枚以上の硬貨が一度

に通過することはない。結果として、分離ローラ2の駆動系に対して大きな負荷をかけることもない。

【0019】また、本実施の形態によれば、分割ベルト1a, 1b間に位置して搬送力を持たない間隔形成部5aを有するので、分離ローラ2により戻したい硬貨C3が中央部（間隔形成部5a）上を搬送されて図1に示すような状況を生じたとしても、硬貨C3の先端が接する間隔形成部5a自身は搬送力を有しないので、送り出し方向の力が減少する。このような状況によれば、分離ローラ2の戻し力により硬貨の重なり状態を解消できることになる。

【0020】本発明の第二の実施の形態を図4に基づいて説明する。第一の実施の形態で示した部分と同一部分は同一符号を用いて示し、説明も省略する。図4は、搬送ベルト等を主体に示す概略斜視図である。本実施の形態では、搬送ベルト1が1枚ベルトとされている。また、ベルト案内板6に関しては搬送ベルト1と分離ローラ2との間の通過間隔Gを規制する間隔形成部6aが平坦部6bと同一高さに形成され、分離ローラ2に対向する部位付近にあっては間隔形成部6aを挟む両側を下方に凹ませたベルト逃げ部6c, 6dが形成されている。

【0021】本実施の形態による場合も、第一の実施の形態の場合と同様な効果が得られる。特に、従来例との対比では、ベルト案内板120をベルト案内板6に変更するだけで目的を達成することができる。

【0022】なお、これらの実施の形態では、ベルト逃げ部5d, 5e, 6c, 6dを凹部により形成したが、例えば、切欠により形成してもよい。

【0023】

【発明の効果】請求項1記載の発明によれば、搬送ベルトの内周側に配設されて、分離ローラに対向する部位に通過間隔を形成する硬貨搬送方向に沿わせた凸状の間隔形成部とこの間隔形成部を挟んで通過間隔以上の間隔を形成可能なベルト逃げ部とを有するベルト案内板材を備えるので、搬送ベルトと分離ローラとの間に重なり状態の硬貨が入り込むようなことがあっても、分離ローラの戻し力により確実に硬貨の重なり状態を解消して1枚ずつの分離搬送を安定して行わせることができる。

【0024】特に、請求項2記載の発明によれば、ベルト逃げ部部分で分割ベルトを逃げ方向に変形しやすくできる上に、搬送力を持たない間隔形成部が通過間隔を形成しているので、分離ローラにより戻そうとする硬貨の送り出し方向の力を減少させることができるため、分離ローラにより硬貨を戻しやすくすることができる。

【図面の簡単な説明】

【図1】本発明の第一の実施の形態を示す概略側面図である。

【図2】その概略平面図である。

【図3】概略斜視図である。

【図4】本発明の第二の実施の形態を示す概略斜視図で

ある。

【図5】従来例を示す釣銭自動払出装置の平面図である。

【図6】その硬貨送出装置部分を示す概略側面図である。

【図7】その概略平面図である。

【符号の説明】

1 搬送ベルト

* 1a, 1b 分割ベルト

2 分離ローラ

5 ベルト案内部材

5a 間隔形成部

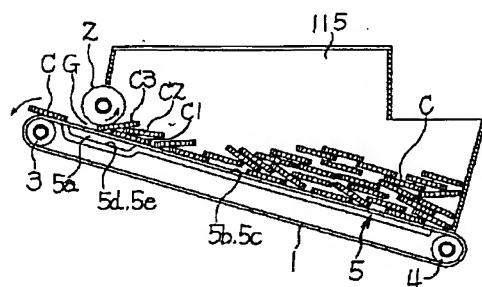
5d, 5e ベルト逃げ部

6 ベルト案内部材

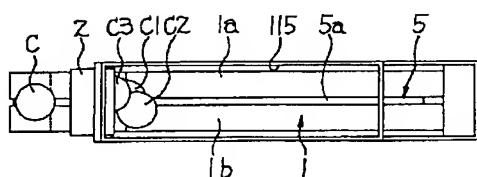
6a 間隔形成部

* 6c, 6d ベルト逃げ部

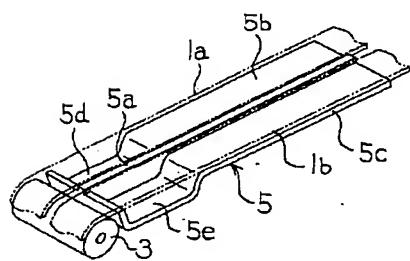
【図1】



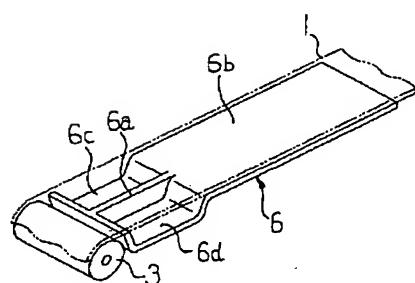
【図2】



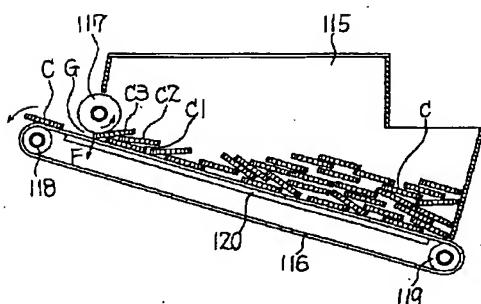
【図3】



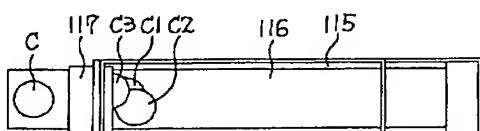
【図4】



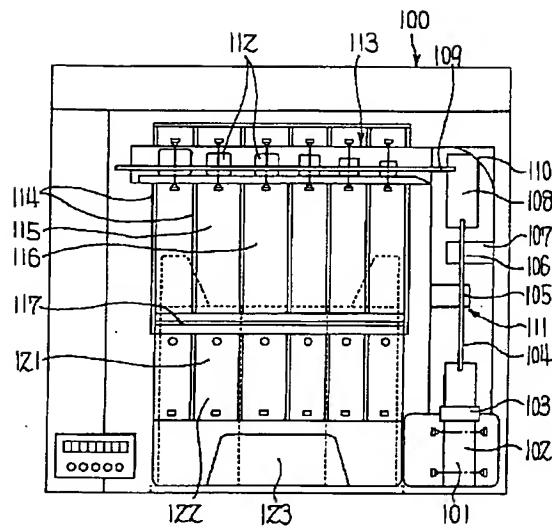
【図6】



【図7】



【図5】



DECLARATION

I, Akiko MATSUI, a member of Intertec Corporation of Toranomon Akiyama Bldg., 22-13, Toranomon 1-chome, Minato-ku, Tokyo, Japan do solemnly and sincerely declare that I well understand the Japanese language and English language and the attached English translation is full, true and faithful translation of the Japanese Unexamined Patent Publication No. Hei 11(1999)-296720.

And I made this solemn declaration conscientiously believing the same to be true.

This 27th day of March, 2006



Akiko MATSUI

[Title of the Invention] Coin delivery unit

[Abstract]

[Subject]

Even when a coin which is in an overlapped state with other coins gets in between a conveyor belt and a separating roller, the overlapped state of coins is to be cancelled positively with a returning force of the separating roller and coins are to be separated and stably conveyed one by one.

[Solution]

When a coin C gets in between a conveyor belt 1 and a separating roller 2 in an overlapped state with other coins and even if a force acting in a direction of pressure-contact with the belt is developed, the conveyor belt is deformed in a relief direction in accordance with belt relief portions 5d and 5e of a belt guide member 5 to form a gap larger than a coin passage gap G, so that the force acting in a coin delivery direction on a coin C3 does not increase. The coin passage gap G is maintained by a convex-shaped gap forming portion 5a formed along a coin conveying direction so as not to permit passage of two or more coins at a time. Moreover, the area of contact of the coin C3 with the conveyor belt 1 which coin is apt to be

returned by the separating roller 2 decreases to be such a degree as to correspond to a width of the gap forming portion 5a, whereby the force acting in the coin delivery direction also decreases. Under such a condition, the overlapped state of coins is cancelled by the returning force of the separating roller 2 and coins can be positively separated and conveyed one by one.

[Claims]

1. A coin delivery unit comprising: a conveyor belt adapted to be rotated in a coin conveying direction; and a separating roller disposed over the conveyor belt through a coin passage gap for passage of one coin at a time and adapted to be rotated in such a manner that the peripheral surface thereof opposed to the conveyor belt moves in a direction opposite to the coin conveying direction of the conveyor belt, coins stacked on the conveyor belt being conveyed while being separated one by one, the coin delivery unit further comprising a belt guide member, the belt guide member including: a gap forming portion of a convex shape disposed on an inner periphery side of the conveyor belt and formed along the coin conveying direction at a position opposed to the separating roller through the coin passage gap; and belt relief portions formed on both sides of the gap forming portion and able to form a gap larger than the coin passage gap.

2. A coin delivery unit according to claim 1, wherein the conveyor belt is divided in two in its transverse direction and the gap forming portion of the belt guide member is positioned between the divided belts.

[Detailed Description of the Invention]

[0001]

[Technical Field of the Invention]

The present invention relates to a coin delivery unit to be used, for example, in an automatic change delivery system which is suitable for use in a connected state to POS terminal or ECR.

[0002]

[Prior Art]

In a conventional automatic change delivery system, coins which are in a mixed state of various types of coins are introduced at a time from an inlet, then are checked whether each of them is a specie or not, thereafter are sorted coin by coin and are stored in a coin receptacle portion, then specified type and number of coins are delivered.

[0003]

Fig. 5 is a plan view showing an example of a conventional automatic change delivery system 100, which system 100 will now be described along the flow of coins. First, coins are introduced at a time from a coin inlet 101 formed on the right lower side of Fig. 5 and are conveyed by an inlet belt 102. The coins are then delivered one by one by an inlet roller 103 and a conveyed in a row. The coins thus conveyed in a row are delivered from the inlet belt 102 to a conveyor belt 104 and are checked for outside

diameter by an outside diameter checker 105 while being conveyed by the conveyor belt 104. As a result, if a coin being conveyed is not a specie or if a coin receptacle portion to be described later is full loaded, the coin is rejected by a reject overflow portion 106. The coin thus rejected by the reject overflow portion 106 is received into a reject overflow coin receptacle portion 107 provided under the reject overflow portion 106.

[0004]

A coin which has passed the reject overflow portion 106 is delivered to a conveyor belt 108 and further, in the course of being delivered to a succeeding conveyor belt 109, the advancing direction of the coin is changed at a right angle by a direction changer 110. Thus, coins are conveyed in a predetermined direction by a coin conveying section 111 which is composed of the inlet belt 102, inlet roller 103 and conveyor belts 104, 108, 109. The coin whose advancing direction has been changed is then guided to a coin sorting section 113, the coin sorting section 113 having sorting holes 112 coin type by coin type which holes become larger in width dimension successively along the conveyor belt 109. The sorting holes 112 are of sizes corresponding respectively to the diameters of 1-, 5-, 10-, 50-, 100- and 500-yen coins and six such sorting holes are

provided. Consequently, coins drop successively from the sorting holes 112 formed coin type by coin type.

[0005]

At positions where the coins drop from the sorting holes 112 there are provided coin receptacle portions 115 which are partitioned by partition plates 114. Conveyor belts 116 for delivery and conveyance of coins are disposed rotatably at bottoms of the coin receptacle portions 115 respectively coin type by coin type, whereby the coins received in the coin receptacle portion 115 are conveyed toward outlets. However, the coins dropped into the coin receptacle portions 115 from the sorting holes 112 are conveyed in a stacked state near the respective dropped positions and therefore it is necessary that the stacked coins be separated one by one and conveyed. To this end, when the conveyor belts 116 are driven, the coins stored in the coin receptacle portions 115 are conveyed through a separating roller 117 in the course of conveyance thereof.

[0006]

The coins separated one by one by the separating roller 117 continue to be conveyed by the conveyor belts 116 and reach a coin stand-by portion 121 which causes a predetermined number of coins to be arranged in a row and stand by constantly coin type by coin type. The coin

stand-by portion 121 causes a predetermined number of coins to stop and stand by temporarily and the operation thereof is controlled so as to deliver a required number of coins in accordance with a command provided from POS terminal or ECR. That is, the coins received in the coin receptacle portions 115 are delivered to predetermined coin delivery positions by means of coin delivery portions 122 which include the conveyor belts 116 respectively as main components. The coins thus delivered to the coin delivery positions are gathered together to a coin delivery port 123 having an upper opening. The cashier can grasp the coins which have been delivered together to the coin delivery port 123 and then deliver them as change to the customer.

[0007]

The separating and conveying operation by the separating roller 117 for the coins stacked on the conveyor belts 116 will now be described with reference to Fig. 6 which is a schematic side view and Fig. 7 which is a schematic plan view. On the inner periphery side of the conveyor belts 116 there are disposed a pair of driving roller 118 and driven roller 119 and a flat belt guide plate 120 for receiving the lower surface on the inner periphery side of the belts flatwise, which components are disposed in an upwardly inclined state as a whole. The

conveyor belts 116 and the separating roller 117 are disposed through a coin passage gap G which permits only one coin C to pass therethrough. Further, the conveyor belts 116 and the separating roller 117 are constructed so as to be rotated in the same direction. That is, both are rotated by the same drive source (motor) so that the conveyor belts 116 rotate in the coin conveying direction, while the peripheral surface of the separating roller 117 opposed to the conveyor belts move in the opposite direction.

[0008]

Consequently, in the event a certain coin included in the stacked coins C should be pinched between a conveyor belt 116 and the separating roller 117, the coin is pushed back to the upstream side in the coin conveying direction with a frictional force induced between the coin and the separating roller 117. Therefore, another coin which underlies that coin undergoes the conveying force in the coin conveying direction of the conveying belt 116 and passes through the coin passage gap G formed between the conveying belt and the separating roller 117. In this way coins are delivered successively one by one.

[0009]

[Problem to be Solved by the Invention]

However, since the coins C on the conveyor belts 116 are stacked in an irregular state on the conveyor belts 116, there sometimes is a case where they cannot be separated in a regular manner, depending on a stacked state of coins C in the coin separating portion. For example, as shown in Fig. 6, when there is a coin C3 which is superimposed on coins C1 and C2 and which is trying to get in between the separating roller 117 and the associated conveying belt 116 in a forwardly inclined state, since there are the coins C1 and C2 upstream of the coin C3, the coin C1 cannot be moved back by the returning force resulting from rotation of the separating roller 117 and it is impossible to cancel the superimposed state of the coins C3, C1 and C2, thus contributing to one cause of coin jam. Particularly, in such a state as shown in Fig. 6, the conveying force of the conveyor belt 116 for the coins C1 and C2 lying on the upstream side exhibits a wedging action against the forwardly inclined coin C3 and a force F acting in a direction of pressure-contact with the belt is exerted on a front end of the coin C3, so that the force acting in the delivery direction for the coin C3 increases and it becomes more and more difficult for the separating roller 117 to push back the coin C3. As a result, a large load is imposed on the drive system for the separating roller 117.

[0010]

Accordingly, it is an object of the present invention to provide a coin delivery unit which can cancel a superimposed state of coins positively with use of a returning force of a separating roller, permitting the coins to be separated and conveyed stably one by one, even when a coin which is in a superimposed state with other coins gets in between a conveyor belt and the separating roller.

[0011]

[Means for Solving the Problem]

According to the invention defined in claim 1 there is provided a coin delivery unit comprising a conveyor belt adapted to be rotated in a coin conveying direction and a separating roller disposed over the conveyor belt through a coin passage gap for passage of one coin at a time and adapted to be rotated in such a manner that the peripheral surface thereof opposed to the conveyor belt moves in a direction opposite to the coin conveying direction of the conveyor belt, coins stacked on the conveyor belt being conveyed while being separated one by one, characterized by further comprising a belt guide member, the belt guide member comprising a gap forming portion of a convex shape and belt relief portions formed on both sides of the gap

forming portion and able to form a gap larger than the coin passage gap, the gap forming portion being disposed on an inner periphery side of the conveyor belt and formed along the coin conveying direction at a position opposed to the separating roller through the coin passage gap.

[0012]

According to this construction, when coins stacked on the conveyor belt get in between the conveyor belt and the separating roller in a mutually superimposed state of the coins, even if there occurs a force acting in a direction of pressure-contact with the belt, the force acting in the coin delivery direction does not increase because the belt is deformed in the relief direction in accordance with the belt relief portions to form a gap larger than the coin passage gap. At this time, the coin passage gap between the conveyor belt and the separating roller is maintained by the convex-shaped gap forming portion disposed along the coin conveying direction, so that not only there is no fear of passage of two or more coins at a time, but also the area of contact of a coin being returned by the separating roller with the conveyor belt decreases to about the width of gap forming portion and so does the force acting in the coin delivery direction. Under such a condition, the superimposed state of coins can be cancelled by the

returning force of the separating roller, thereby permitting the coins to be separated and conveyed one by one positively.

[0013]

According to the invention defined in claim 2, the conveyor belt in the coin delivery unit of claim 1 is divided in two in its transverse direction and the gap forming portion of the belt guide member is positioned between the divided belts. With this construction, the divided belts can be easily deformed in the relief direction in the belt relief portions; besides, since the gap forming portion not having a conveying force forms the coin passage gap directly, the area of contact of the coin being returned by the separating roller with the conveyor belts (divided belts) decreases and so does the force acting in the coin delivery direction, thus permitting the coin to be returned more easily by the separating roller.

[0014]

[Mode for Carrying Out the Invention]

A first embodiment of the present invention will now be described with reference to Figs. 1 to 3. Fig. 1 is a schematic side view of a coin delivery unit, Fig. 2 is a schematic plan view thereof, and Fig. 3 is a schematic perspective view showing mainly a conveyor belt, etc. The

coin delivery unit of this embodiment is also applied to the coin separating and conveying portion between each coin receptacle portion 115 and coin stand-by portion 121 in such an automatic change delivery system 100 as shown in Fig. 5. As to the entire construction thereof, the automatic change delivery system 100 is utilized.

[0015]

First, the coin delivery unit of this embodiment comprises as basic components a conveyor belt 1 and a separating roller 2 which are disposed between each coin receptacle portion 115 and coin stand-by portion 121. The conveyor belt 1 is made up of belts 1a and 1b divided in two in its transverse direction. On the inner periphery side of the conveyor belt 1 are disposed not only a pair of driving roller 3 and driven roller 4 but also a flat belt guide plate (belt guide member) 5 for basically receiving the inner periphery-side lower surface of the belt. These components are disposed so as to be upwardly inclined toward the coin stand-by portion 121 as a whole. The conveyor belt 1 and the separating roller 2 are disposed through a coin passage gap G which permits only one coin C to pass therethrough at a time. Further, the conveyor belt 1 and the separating roller 2 are constructed so as to be rotated in the same direction. That is, the conveyor belt

1 and the separating roller 2 are rotated by the same drive source (motor) in such a manner that the conveyor belt 1 rotates in the coin conveying direction and the peripheral surface of the separating roller opposed thereto moves in the opposite direction.

[0016]

In the belt guide plate 5 used in this embodiment, as shown in Fig. 3, a convex-shaped gap forming portion 5a for forming a predetermined coin passage gap G is formed along the coin conveying direction at a position opposed to the separating roller 2. The gap forming portion 5a is positioned between the divided belts 1a and 1b and is exposed to the exterior to form the coin passage gap G directly between it and the separating roller 2. The gap forming portion 5a is positioned within the coin passing width. The belt guide plate 5 is formed with flat portions 5b and 5c for receiving the inner periphery surfaces of the divided belts 1a and 1b respectively on both right and left sides of the gap forming portion 5a. In the flat portions 5b and 5c, downwardly depressed belt relief portions 5d and 5e are formed near the position opposed to the separating roller 2.

[0017]

In such a construction, in the event a certain coin

included in stacked coins C on the conveyor belt 1 should be pinched between the conveyor belt 1 and the separating roller 2, the coin is pushed back to the upstream side in the coin conveying direction with a frictional force created between it and the separating roller 2.

Consequently, another coin which underlies that coin undergoes coin conveying force of the conveying belt 1 acting in the coin conveying direction and passes through the coin passage gap G formed between the conveyor belt 1 and the separating roller 2. In this way coins are delivered successively one by one.

[0018]

Since the coins C on the conveyor belt 1 are stacked in an irregular stage, they present various superimposed states in the separating portion, but generally the coins are conveyed while being mutually superimposed transversely in a zigzag fashion on the conveyor belt 1. For example, it is here assumed that a coin C3 tends to get in between the separating roller 2 and the conveyor belt 1 in a somewhat forwardly inclined attitude while being superimposed on coins C1 and C2. In this case, the other coins C1 and C2 lie upstream of the coin C3 and the conveying force of the conveyor belt 1 for the coins C1 and C2 exhibits a wedging action against the forwardly

inclined coin C3, so that a force acting in a direction of pressure-contact with the belt is exerted on a front end of the coin C3. In this portion, however, the belt relief portion 5d is formed in the belt guide plate 5 in the case of the illustrated example, so that the portion of the divided belt 1a which has undergone the force acting in the direction of pressure contact with the belt by the front end of the coin C3, the coin C3 now being in a lowered state to the left front side, is deformed toward the belt relief portion 5. Thus, the force acting in the coin C3 delivery direction does not increase. At this time, at least one side near the center of the coin C3 is conveyed while being supported over the gap forming portion 5a and is prevented from sinking. Thus, the divided belt 1a is not deformed more than necessary to such an extent as permits the passage of coin C3. Under the same condition, even when the coin C3 is conveyed mainly on the divided belt 1b side, the divided belt 1a is deformed to the belt relief portion 5e side and the force acting in the delivery direction on the coin C3 does not increase. Particularly, in this embodiment, since the conveyor belt 1 is divided into divided belts 1a and 1b, the divided belts are easy to be deformed in the relief direction in the relief portions 1a and 1b. In such a condition, the coin C3 can be

returned positively with the returning force of the separating roller 2 and the overlapped state of coins can be cancelled. For example, after return and separation of the coin C3, the coin C1 can be conveyed to the downstream side. At this time, the coin passage gap G between the conveyor belt 1 and the separating roller 2 is maintained by the convex-shaped gap forming portion 5a formed along the coin conveying direction and a part of the coin C1 is sure to pass over the gap forming portion 5a, so that there is no fear of two or more coins passing at a time through the belt relief portion 5d or 5e. As a result, a heavy load is not imposed on the drive system for the separating roller 2.

[0019]

According to this embodiment, moreover, since the gap forming portion 5a not having a coin conveying force is positioned between the divided belts 1a and 1b, even if the coin C3 to be returned by the separating roller 2 is conveyed over the central portion (the gap forming portion 5a) and there occurs such a condition as shown in Fig. 1, the force acting in the coin delivery direction decreases because the gap forming portion 5a itself with which the front end of the coin C3 is in contact does not have a coin conveying force. Under this condition, the overlapped

state of coins can be cancelled by the returning force of the separating roller 2.

[0020]

A second embodiment of the present invention will be described with reference to Fig. 4. The same portions as in the first embodiment are identified by the same reference numerals, and explanations thereof will be omitted. Fig. 4 is a schematic perspective view mainly showing the conveyor belt, etc. The conveyor belt 1 used in this second embodiment is a single belt. As to a belt guide plate 6, a gap forming portion 6a for defining the coin passage gap G between the conveyor belt 1 and the separating roller 2 is formed level with a flat portion 6b, and near the portion opposed to the separating roller 2 there are formed belt relief portions 6c and 6d which are downwardly depressed on both sides of the gap forming portion 6a.

[0021]

Also by this second embodiment there are obtained the same effects as in the first embodiment. Particularly, in comparison with the prior art, the desired object can be achieved by only replacing the belt guide plate 120 with the belt guide plate 6.

[0022]

Although in the above embodiments the belt relief portions 5d, 5e, 6c and 6e are formed by recesses, they may be formed by notches for example.

[0023]

[Effect of the Invention]

Since the coin delivery unit defined in claim 1 comprises a belt guide member, the belt guide member comprising a gap forming portion of a convex shape and belt relief portions formed on both sides of the gap forming portion and able to form a gap larger than the coin passage gap, the gap forming portion being disposed on an inner periphery side of the conveyor belt and formed along the coin conveying direction at a position opposed to the separating roller through the coin passage gap, even if a coin which is in a superimposed state on other coins gets in between the conveyor belt and the separating roller, the superimposed state of coins is cancelled positively with the returning force of the separating roller and coins can be separated one by one and conveyed stably.

[0024]

Particularly, according to the invention defined in claim 2, a divided belt can be easily deformed in a relief direction in a belt relief portion and the gap forming portion not having a conveying force forms the coin passage

gap, so that the force acting in the coin delivery direction on a coin which is to be returned by the separating roller can be decreased and hence the coin can be made easier to return by the separating roller.

[Brief Description of the Drawings]

Fig. 1 is a schematic side view showing a first embodiment of the present invention;

Fig. 2 is a schematic plan view thereof;

Fig. 3 is a schematic perspective view thereof;

Fig. 4 is a schematic perspective view showing a second embodiment of the present invention;

Fig. 5 is a plan view of a conventional automatic change delivery system;

Fig. 6 is a schematic side view showing a coin delivery unit portion thereof; and

Fig. 7 is a schematic plan view thereof.

[Explanation of Reference Numerals]

1 conveyor belt

1a, 1b divided belts

2 separating roller

5 belt guide member

5a gap forming portion

5d, 5e belt relief portions

6 belt guide member

6a gap forming portion
6c, 6d belt relief portions